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Imaging

VISUALIZATION OF FLOW DYNAMICS FROM PULMONARY VEINS TO LEFT ATRIUM AND LEFT VENTRICLE USING PHASE-RESOLVED 3D CINE PHASE CONTRAST MRI (4D-FLOW)

Poster Contributions
Poster Sessions, Expo North
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Session Title: Imaging: MRI IV CMR in Valve Disease and Imaging Intracardiac and Vascular Flows
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Background: Flow dynamics from the pulmonary veins (PVs) to the left ventricle (LV) is crucial for global cardiac function and for a formation of thrombus at the left atrium (LA). 4D-Flow enabled us to visualize intra-vascular blood flow, but has not been applied to evaluate the intra-cardiac flow dynamics. We aimed to image the flow dynamics from PVs to LA and LV using 4D-Flow, and examined the factors that affect it.

Methods: 24 patients (58±18 years) underwent 4D-Flow with routine cardiac MRI. We set a plane traversing each exit of PV and traced the particles as particle trace during a cardiac cycle (Figs. A: the initial phase, B: the last phase). %LV particle was calculated in each PV; (the number of particles that reached LV) / (a total number of particles on PV sections) x 100.

Results: The end-diastolic LV volume, LV ejection fraction (LVEF) and maximum LA dimension (LAD) were 133±54 ml, 51±16% and 36±8 mm, respectively. The medians of %LV particles from right upper and lower PVs were 5.3% (0-19, inter-quartile) and 5.5% (0-28), whereas those from left upper and lower PVs were 0% (0-3.7) and 0% (0-7.1), respectively (p=0.02). The %LV particle from all PVs correlated positively with LVEF (r=0.45, p=0.03) and negatively with LAD (r=-0.45, p=0.02).

Conclusions: 4D-Flow can separately clarify the flow contributions from each PV to LA and LV. The blood flow from left PVs is more stagnant within LA than that from right PVs. The LV function and LA size may affect the flow dynamics from PVs to LV.